ROTARY TOOTHBRUSH

BY

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BACKGROUND OF THE INVENTION

The present invention relates to a rotary toothbrush.

More particularly, this invention relates to a electrically operated rotary toothbrush with a rotating brush, the diameter of which increases toward its free end.

There are many rotary toothbrushes by prior art.

US Patent No. 3,451,086 to Burgett discloses a motor powered rotary toothbrush having a reciprocating cylindrical brush, and a brush shield.

US Patent No. 3,739,416 to Kurachi discloses a hygienically shielded rotary toothbrush having a brush shield.

US Patent No. 4,275,749 to Caroli discloses an electrically driven continuous toothbrush that has an interchangeable brush and a protective cap.

US Patent No. 4,335,480 to Liu discloses an electric rotary toothbrush having an integral stem and brush guard housing, and a removable brush.

US Patent No. 4,882,801 to Benz discloses an electric toothbrush having a gravity-induced movement responsive

switch that automatically reverses the direction of rotation.

US Patent No. 5,044,035 to Barradas discloses a dental cleaning device having helical brush tufts and a partial shield for collecting particles.

US Patent No. 5,428,855 to Li discloses a rotatable toothbrush having two brushes rotating in opposite directions with each other.

US Patent No. 5,794,296 to Wong discloses an electric toothbrush having a direction controller that controls the direction of brush rotation and stabilizes the toothbrush during brushing operation.

US Patent No. 5,864,911 to Arnoux et al. discloses a toothbrush with a dual rotary brushing system that has two adjacent contra-rotating brushes, and flexible shafts driving the brushes.

While rotary toothbrushes by prior art provides various functionalities regarding rotation of the brushes and covering the brushes, all of them use cylindrical brushes for teeth brushing operations. None of them provides brushes that have a shape adapted specifically to the shape of the teeth and thus optimized to the tooth-brushing operation.

SUMMARY OF THE INVENTION

The present invention contrives to solve the disadvantages of the prior art.

An objective of the invention is to provide a rotary toothbrush having a brush that has a shape adapted to the shape and arrangement of the teeth.

Another objective of the invention is to provide a rotary toothbrush having a brush that is optimized to tooth-brushing operation.

Still another objective of the invention is to provide a rotary toothbrush that provides control of brush and protection of soft tissues of the oral cavity from the rotating brush.

To achieve the above objectives, a rotary toothbrush including a housing, a brush that is rotatably attached to the housing, and a motor, which is installed inside the housing and rotates the brush, is provided. The brush includes a first end that is rotatably attached to the housing, and a second end that is opposite to the first end. The diameter of the brush increases toward the second end.

The diameter of the brush linearly increases from the first end to the second end. Alternatively, the diameter of the brush exponentially increases from the first end to the

second end. The brush may further comprise a portion that has a constant diameter near the second end.

A shaft connects the brush and the motor. The rotational speed of the shaft is adjustable.

The rotary toothbrush further includes a cover that partially covers the brush in an arc when it is viewed in a plane perpendicular to the shaft. The size of the arc is in a range from about 45° to about 180°.

The motor selectively rotates the brush either clockwise or counterclockwise. The motor is powered by an electric battery. Alternatively, the motor is powered by household alternating current.

The advantages of the present invention are: (1) the brush is effective in cleaning between teeth; (2) the brush is advantageous in reaching deeply into the oral cavity.

Although the present invention is briefly summarized, the fuller understanding of the invention can be obtained by the following drawings, detailed description and appended claims.

DESCRIPTION OF THE FIGURES

These and other features, aspects and advantages of the present invention will become better understood with reference to the accompanying drawings, wherein:

FIG. 1 is an elevation view of a rotary toothbrush according to the present invention;

FIG. 2 is a side elevation view of the toothbrush showing a cover that partially covers a rotating brush;

FIG. 3 is a view similar to FIG. 2 and shows a different size of the cover;

FIG. 4 is a schematic view showing the operation of the toothbrush;

FIG. 5 is a partial elevation view showing a first embodiment of the rotating brush;

FIG. 6 is a partial elevation view showing a second embodiment of the rotating brush;

FIG. 7 is a partial elevation view showing a third embodiment of the rotating brush; and

FIG. 8 is a schematic cross-sectional view of the rotary toothbrush.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows a rotary toothbrush **10** according to the present invention. The rotary toothbrush **10** includes a housing **12**, a brush **14** that is rotatably attached to the housing **12** and a motor **16** (refer to FIG. 8) that is installed inside the housing **12** and rotates the brush **14**. The motor **16** rotates the brush **14** via a gear train **18** that

reduces the rotational speed, and a shaft **20** that connects between the gear train **18** and the brush **14**. The motor **16** may be powered by household alternating current as in FIG. 1, which shows an electric plug **13** that is adapted to an electric outlet in a house. Alternately, the motor **16** may be powered by one or more electric batteries **15** as shown in FIG. 8.

FIGS. 1-3 show that the rotary toothbrush **10** further includes a cover **22** that partially covers the brush **14** in an arc when it is viewed in a plane perpendicular to the shaft. The size of the arc is in a range from about 45° to about 180°. The cover protects soft tissues other than the teeth and gums in the oral cavity when the toothbrush **10** is operating. The size of the cover may be chosen depending on user's preference or skill to use the toothbrush **10**.

FIG. 5 shows that the brush **14** includes a first end **24** that is rotatably attached to the housing **12** via the shaft **20**, and a second end **26** that is opposite to the first end **24**. The diameter of the brush **14** increases toward the second end **26**. Specifically, FIG. 5 shows a first embodiment of the brush **12**, in which the diameter of the brush **14** linearly increases from the first end **24** to the second end **26**.

FIG. 6 shows a second embodiment of the brush **14**, in which the diameter of the brush exponentially increases from the first end **24** to the second end **26**.

FIG. 7 shows a third embodiment the brush **14**, in which the brush **14** further includes a portion **28** that has a constant diameter near the second end **26**.

The various shapes enable the brush **14** to reach into further or deeper to and between the teeth, and to provide more brushing operation to bigger teeth.

In addition to the shapes shown in FIGS. 5-7, the brush **14** may have any additional portion such as a short-tapered portion at the second end **26**, as far as the diameter increases gradually from the first end **24** to the second end **26** in the overall shape of the brush **14**.

FIG. 4 shows the operation of brush **14** when the toothbrush **10** is used clean teeth **30**. How the larger end diameter of the brush **14** facilitates cleaning between the teeth **30** is clearly understood from the illustration.

FIG. 8 shows that a control switch **32** is provided on the side of the housing **12**. A user can control the motor **16** so that the motor **16** selectively rotates the brush **14** either clockwise or counterclockwise as shown in FIG. 3, or to adjust the rotational speed of the shaft **20**, and thus the brush **14**. The cover **22** has a neck **34** extending

therefrom. The neck **34** is detachably attached to the housing **12** so that cleaning the brush **14** and the cover **22**, and replacing the brush **14** are facilitated.

While the invention has been shown and described with reference to different embodiments thereof, it will be appreciated by those skilled in the art that variations in form, detail, compositions and operation may be made without departing from the spirit and scope of the invention as defined by the accompanying claims.